Gold Deposits in the Meguma Group of Nova Scotia

Nova Scotia

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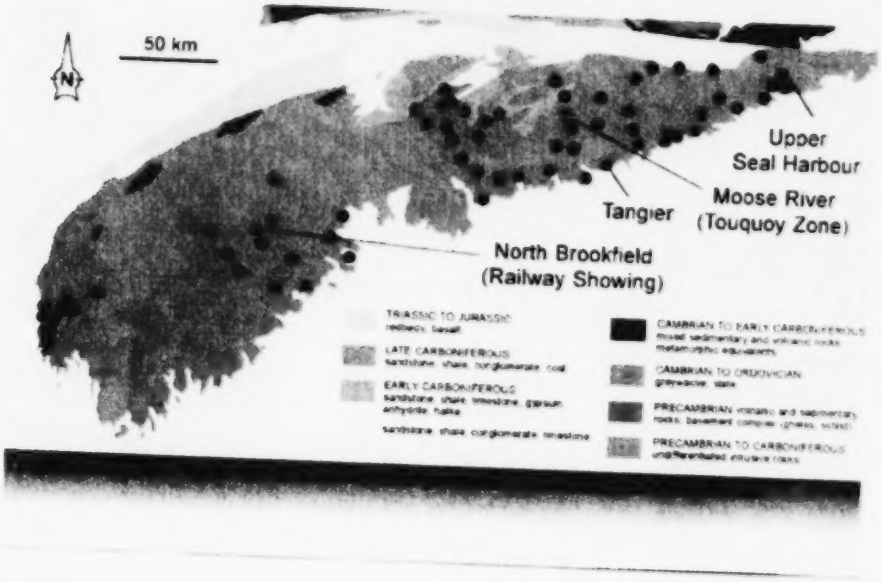
Introduction

Gold deposits in the lower Paleozoic Meguma Group of southern Nova Scotia can be categorized as: (1) high-grade, narrow (<1 m), auriferous quartz veins; (2) low-grade (few grams per tonne) disseminated gold in metamorphosed sandstone and shale; and (3) a combination of the former two. Virtually all historical production (1.2 million oz.) came from high-grade quartz vein systems where underground mining never exceeded 300 m depth. There is excellent potential for large tonnage, bulk mining based on the recent discovery of disseminated gold in metasedimentary rocks at many of the former gold districts.

Geological Setting

The Cambrian to Ordovician Meguma Group, which dominates the bedrock geology of southern Nova Scotia, comprises a basal sandy flysch (Goldenville Formation) and overlying shaly flysch (Halifax Formation). These strata are variably deformed into upright, northeast-trending, gently to moderately plunging folds with multiple cleavages. Meguma Group rocks are metamorphosed to greenschist - amphibolite facies, and are intruded by ca. 370 Ma peraluminous granites and minor mafic intrusions.

Gold occurs throughout the Meguma Group stratigraphy, but is most prevalent in the Goldenville Formation. Gold is generally localized in laterally continuous veins along the limbs of domal structures. Veins were emplaced during hydrofracturing in brittle-ductile deformation zones. Vein mineralogy is dominated by quartz, carbonate and Fe-sulphides with free gold (>900 fine) in nugget size (<11 oz.) to micron size grains. Vein minerals also include pyrite, pyrrhotite, arsenopyrite, Fe-oxides, chalcopyrite, galena, sphalerite, silicates and minor associated Fe, Gu, Pb, Sb, W, Zn, Ag and Bi phases. Gold occurs (1) in vein silicates, (2) in wallrocks, and (3) associated with sulphides. Mineralized veins cross-cut and alter contact metamorphic porphyroblasts (ca. 370 Ma). Hydrothermal vein minerals (muscovite, biotite and amphibole) dated by the $^{40}Ar/^{39}Ar$ method yield ages of 370 ± 6 Ma. Isotopic studies (0, G, D, Sr, Pb) indicate multiple source reservoirs, including the Meguma Group and its underlying basement, for the aqueous-carbonic fluids that deposited gold.



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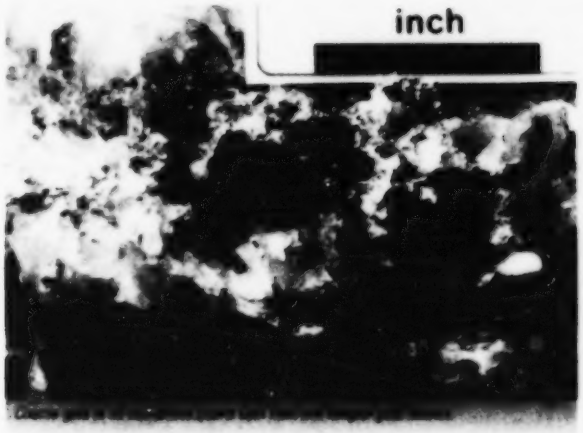

Vein Deposits: The gold districts of Nova Scotia host numerous types of quartz veins that record highly variable degrees of strain. Vein types include: (1) bedding concordant, (2) angular, (3) en echelon, (4) stockwork, (5) fissure veins, and (6) ac veins. Most of the gold was recovered from the first five types, and type 1 veins were the richest. High-grade (<15 g/t Au) ore shoots are common in type 1 (bedding concordant) veins, at their intersection with angular or fissure veins, and locally within the other vein types. Vein packages show lateral continuity on the scale of kilometres.

Disseminated Deposits:
Disseminated gold, with minor electrum and associated intermetallic compounds, occurs at several gold districts where the host shale and sandstone are altered (carbonate, sulphide, sericite alteration). Examples include the shale-hosted Touquoy Zone (2 Mt, 2.2 g/t) of the Moose River gold district, and the sandstone-hosted Railway Showing at North Brookfield (19 m, 1.2 g/t). At present, disseminated gold has been found in 19 former gold districts. Gold grains are 0.5 µm to 2 mm in diameter, but most are <100 µm, and are either spheroidal with an electrum core (± As, Fe, Cu, Pb) or irregular nuggets. Pb, Ag, Cu, W, Fe, Sb and Sn are present as native metals in mineralized samples. The absolute age of this style of mineralization remains unknown, but it post-dates the peak of regional deformation.

Combined Vein and Disseminated Deposits:
This style of mineralization, combining the former two, involves veins and the intervening wallrock and has strong potential for large tonnage deposits. The Upper Seal Harbour gold district is presently undergoing exploration to delineate reserves associated with combined vein and disseminated gold.

Model for Meguma Gold Mineralization
Field relationships and absolute age dating show that Meguma gold deposits formed during the waning stages of the Acadian Orogeny in the Late Devonian - Early Carboniferous. Quartz veins were emplaced into dilatant zones on the limbs and hinge areas of regional folds in response to late-stage compression and anomalously high fluid pressures. The coincidence of fluid generation and vein emplacement with basement metamorphism (380 Ma) and intrusion of granites ± minor mafic rocks (370 Ma) suggests a spatial and temporal association, but geochemical data exclude a genetic association. Localization of mineralized zones in antiformal structures probably reflects the favourable nature of such structures.

Genetic models for gold deposits in the Meguma Group are remarkably similar to current models proposed for the productive Bendigo-Ballarat-Victoria gold fields of Australia (80 million oz. production). Potential for the discovery of additional deposits in Nova Scotia is considered to be excellent.

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